

Plasma Triglyceride and Cholesterol Levels in Normotensive and Hypertensive Pregnant and Parturient Nigerian Women.

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Abstract

Context: There are conflicting reports on the concentration of plasma lipid fractions in pregnant Nigerians.

Objectives: This study compares the plasma lipid levels in non-pregnant normotensive women with those in normotensive pregnant women and hypertensive pregnant women in the second and third trimesters and at three days postpartum.

Study Design: Hypertensive women numbering 75, aged between 20 and 39 years were selected from the clinics of the Obstetrics and Gynaecology Department, Obafemi Awolowo University Teaching Hospitals Complex (OAUTHC). A comparable group of 75 normotensive pregnant women and 25 normotensive women who were not pregnant were also recruited. Plasma total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), low density lipoprotein cholesterol (LDL-C) and triglyceride (TG) were assayed for all the patients, using established enzymatic methods.

Results: In the 2nd trimester, plasma TG, HDL-C and TC were significantly higher and LDL-C lower in normotensive pregnancy than in non-pregnant women ($p < 0.001$). In the same period, plasma TG, HDL-C and TC were lower and LDL-C higher in hypertensive pregnant women than in their normotensive counterparts and the non-pregnant ($p < 0.001$). This pattern was also evident in the 3rd trimester. The blood pressure levels dropped to different extents and all the plasma lipids were reduced to similar levels in both the normotensive and hypertensive groups at 3 days postpartum.

Conclusion: There is hyperlipidaemia in normal pregnancy with significantly lower LDL-C and higher HDL-C compared to the non-pregnant. There is elevated LDL-C and lower HDL-C in hypertensive pregnant women. There is a noticeable decline in plasma lipid levels by the 3rd day postpartum.

Key Words: Triglycerides, Lipoproteins, Cholesterol, Hypertension, Pregnancy. [Trop J Obstet Gynaecol, 2003, 20: 119-122]

Introduction

Triglycerides (TG) are a store of energy in the body and they provide the extra energy required in pregnancy. Cholesterol is the precursor of steroid hormones, which are required for implantation and maintenance of pregnancy. Cholesterol is also required for cell wall formation in the growing fetus. All the early studies reported raised plasma TG and cholesterol throughout pregnancy^{1,2}. Facilities now exist for assaying cholesterol in all its forms namely: high density lipoprotein-cholesterol (HDL-C), low density lipoprotein-cholesterol (LDL-C) and very low density lipoprotein-cholesterol (VLDL-C). The more recent reports on the plasma lipoprotein cholesterol fractions are inconclusive. Some workers report a fall in plasma LDL-C and a rise in HDL-C throughout normal pregnancy³, while others report a raised LDL-C⁴. The plasma LDL-C seems to be higher in hypertensive pregnant women while their HDL-C is lower than in their normotensive counterparts according to findings in Caucasians⁵.

This study was undertaken to clarify the status of the lipoprotein cholesterol fractions in normotensive

and hypertensive pregnant women in this environment, especially as the blood pressure levels in hypertensive pregnant Nigerians seem to be lower than in Caucasians^{6, 7}. The findings should contribute to the database on lipids in hypertensive pregnancy and improve the care of pregnant women in Ile-Ife.

Patients and Methods

A group of 75 hypertensive pregnant women aged 20 to 39 years were selected from the clinics and wards of the Obstetrics & Gynaecology Department, Obafemi Awolowo University Teaching Hospitals Complex (OAUTHC). In the group, 25 were in the second trimester (22 to 24 weeks), 25 were in the third trimester (33 to 36 weeks) and 25 three days after delivery. None were in the first trimester because hypertension, especially pregnancy-induced hypertension (PIH), rarely occurs in the first trimester⁸.

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A counterpart group of 75 normotensive pregnant (NP) matched for age with the hypertensive group and divided into the same gestational age groups was also assembled. A third group of 25 normotensive, non-pregnant women who were not taking hormonal contraceptives and had been in good health in the preceding 6 months was also selected.

Each patient, after giving consent for participation, had 10 ml of venous blood collected between 9.00 and 10.30 am and put in lithium heparin tubes. The samples were centrifuged in the laboratory. The

separated plasma was stored in plastic tubes at 4°C or analysed immediately. Established methods were used for the estimation of cholesterol⁹, HDL-C^{9,10} and triglycerides¹¹. The LDLC was computed by Friedwald formula as recorded by Tietz¹².

The data was analysed with the SPSS statistical programme (version 10). Means were compared using the one-way analysis of variance (ANOVA). *Post hoc* tests were done to isolate differences found with ANOVA.

Table 1

Plasma Lipid Concentrations in Non-Pregnant Compared to 2nd Trimester Pregnant Women

Variable	Normotensive Non-Pregnant A (n = 25)	Normotensive Pregnant B (n = 25)	Hypertensive Pregnant C (n = 25)	Comparison	
				A vs B	B vs C
Age (years)	28 ± 4.90	29.1 ± 3.80	30.1 ± 4.62	NS	NS
Parity	1.0 ± 1.12	0.84 ± 0.65	1.5 ± 1.19	NS	NS
SBP (mmHg)	100 ± 10.90	106 ± 10.07	154 ± 11.18	NS	<i>p</i> < 0.001
DBP (mmHg)	70 ± 23.10	64 ± 6.3	105 ± 11.70	NS	<i>p</i> < 0.001
TG (mmol/L)	0.41 ± 0.12	0.69 ± 0.27	1.5 ± 0.26	<i>p</i> < 0.001	<i>p</i> < 0.001
TC (mmol/L)	3.6 ± 0.72	4.2 ± 0.09	3.8 ± 0.31	<i>p</i> < 0.001	<i>p</i> < 0.001
HDLC (mmol/L)	2.4 ± 0.35	3.3 ± 0.33	1.9 ± 0.22	<i>p</i> < 0.001	<i>p</i> < 0.001
LDLC (mmol/L)	1.10 ± 0.7	0.72 ± 0.50	1.6 ± 0.35	<i>p</i> < 0.001	<i>p</i> < 0.001

SBP = Systolic Blood Pressure; DBP = Diastolic Blood Pressure; TG = Triglyceride; TC = Total Cholesterol; HDLC = High Density Lipoprotein Cholesterol; LDLC = Low Density Lipoprotein Cholesterol.

Results

The clinical characteristics and the plasma lipid concentrations of the non-pregnant women and the two groups of pregnant women in the 2nd trimester of pregnancy are seen in Table 1. The plasma levels of TG, HDLC and TC were significantly higher and the LDLC level lower in normotensive pregnancy than in non-pregnant women (*p* < 0.001). In the same period, plasma TG, HDLC and TC were lower and LDLC higher in hypertensive pregnant women than in their normotensive counterparts and the non-pregnant group (*p* < 0.001).

Table 2 shows the blood pressure measurements and the plasma lipid levels in the normotensive and the hypertensive women in the 3rd trimester of pregnancy and on the 3rd day post-partum.

Discussion

The study reports hyperlipidaemia in normal pregnancy (NP) in the second trimester compared to what is found in non-pregnant women of

comparable age. This conforms to the previous findings in Nigerians reported by Das and Isichei⁴ and those in Caucasian populations^{3,13,14}. They are, however, in conflict with findings in pregnant women in Lagos, a major metropolitan city¹⁵. The hyperlipidaemia is even more pronounced in hypertensive women in the 2nd trimester, particularly in the plasma triglyceride concentration.

In the third trimester, the TG level in the hypertensive group dips below those of the normotensive group, a situation that persists in the early puerperium. The LDLC level however remains significantly higher in the hypertensive patients until the early puerperium when it drops to levels similar to those of the normotensive group. The HDLC levels are significantly higher in the normotensive group during pregnancy, but this difference is again blunted shortly after birth. Similar findings have been reported in Caucasians and Asians^{5,14,16}. Thus, although the blood pressure levels may be lower in Nigerians than Caucasians⁶, the pattern of change in plasma lipids are similar^{15,16}.

Table 2
Comparison of Lipid Levels Between Normotensive and Hypertensive Women in the 3rd Trimester and Day 3 Postpartum.

Groups	Normotensive Pregnant D (n = 25)	Hypertensive Pregnant E (n = 25)	Comparison
3rd Trimester			
Age (years)	28.5 ± 5.10	28.2 ± 5.04	
Parity	1.5 ± 1.19	1.16 ± 1.07	
SBP (mmHg)	110 ± 12.07	155 ± 11.50	p < 0.001
DBP (mmHg)	66.0 ± 7.6	104 ± 11.18	p < 0.001
TG (mmol/L)	1.06 ± 0.31	0.90 ± 0.28	p < 0.001
TC (mmol/L)	4.9 ± 0.76	4.4 ± 0.63	p < 0.001
HDLC (mmol/L)	3.0 ± 0.53	1.5 ± 0.22	p < 0.001
LDLC (mmol/L)	1.7 ± 1.12	2.7 ± 0.72	p < 0.001
Day 3 Postpartum			
Age (years)	30.17 ± 3.53	31.58 ± 4.15	
Parity	1.04 ± 0.94	1.44 ± 1.35	
SBP (mmHg)	106 ± 8.60	140 ± 13.5	p < 0.001
DBP (mmHg)	65 ± 11.90	92 ± 10.01	p < 0.001
TG (mmol/L)	0.79 ± 0.26	0.94 ± 0.40	p < 0.001
TC (mmol/L)	4.0 ± 0.71	3.9 ± 0.38	NS
HDLC (mmol/L)	2.2 ± 0.49	2.3 ± 0.40	NS
LDLC (mmol/L)	1.7 ± 0.86	1.5 ± 0.79	NS

The marked difference in the triglyceride levels of hypertensives in the 2nd and 3rd trimester is difficult to explain, but may be attributable to the fact that the types of hypertension prevalent in the two trimesters differ. Those seen in the 2nd trimester are more likely to have hypertension predating onset of

pregnancy, whereas those seen in the 3rd trimester are more likely to be patients with pre-eclampsia. The increasing hyperlipidaemia from the second to the third trimester in normotensive pregnancy is probably required for meeting the greater need for energy in the form of raised TG and of cholesterol for steroidogenesis and cell membrane synthesis, as the fetus is growing rapidly during this period.

In hypertensive pregnant women, TG and HDLC fall while LDLC rises significantly from second to the third trimester. The high level of LDLC would have contributed to the formation of atheromatous plaques in the arterial walls of non-pregnant women leading to hypertension and other cardiovascular diseases, but these increases are relatively transient because they drop to levels comparable to those of normotensive women by the third day post-partum, with no evidence of a residual blood vessel damage. This supports the findings of Franz and Windler¹⁴ but does not support the hypothesis of a low concentration of toxicity preventing albumin which is supposed to buffer excessive TG and free fatty acid in PIH which is said to lead to transient capillary damage and hypertension^{15, 17, 18, 19, 20}. The status of plasma albumin and free fatty acid in PIH needs to be elucidated.

There is significant hyperlipidaemia in normal pregnancy. There is however a significantly lower LDLC concentration than in the non-pregnant. Conversely, the HDLC concentration is higher compared to the non-pregnant. There is elevated LDLC and lower HDLC in hypertensive pregnant women. There is a noticeable decline in plasma lipid levels by the 3rd day postpartum, with the values in hypertensive women rapidly approaching the levels seen in their normotensive counterparts.

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